Journal of Physics: Conference Series **203** (2010) 012116 doi:10.1088/1742-6596/203/1/012116

Gran Sasso National Laboratory: Outreach and Communication activities.

R Antolini, A Di Giovanni, M Galeota, S Sebastiani
INFN Laboratori Nazionali del Gran Sasso, SS 17 bis km 18+910, 67010 Assergi(AQ)

E-mail: adriano.digiovanni@lngs.infn.it

Abstract. Due to its fascinating structures, the Gran Sasso National Laboratory (LNGS) offers huge opportunities for communication and outreach activities conceived for students and general public. A great effort is devoted to the organisation of the "OPEN DAY", in which the scientific staff of Gran Sasso introduces non expert people to the main relevant research topics of the laboratory through interactive demonstrations and particle detectors. In particular, a portable cosmic rays telescope has been realized: the detector is used by LNGS team in pubblic events as well as to promote the scientific activities of the Laboratory. In order to point out the importance of the scientific culture for young people, LNGS is involved in the organisation of several training courses for students and teachers focused on the improvement of the knowledge on modern physics topics. Since May 2008 is operating in Teramo the "Galileium", an interactive museum for physics and astrophysics.

1. Introduction

The Gran Sasso National Laboratory (LNGS), located between the towns of L'Aquila and Teramo, about 120 km from Rome is one of the four laboratories of the National Institute for Nuclear Physics. It is the largest underground laboratory in the world for experiments in astroparticle physics, nuclear astrophysics and rare decays. Main research topics of the present programme are neutrino physics, with neutrinos naturally produced in the Sun and in Supernova explosions, neutrino oscillations with an artificial beam from CERN (CNGS program), search for neutrino mass in neutrinoless double beta decay, dark matter search, nuclear reactions of astrophysical interest. The Gran Sasso National Laboratory is located inside the National Park of Gran Sasso and Monti della Laga. Since its first years of operation the LNGS has been involved in the organisation of several events meant to promote the scientific culture in general.

2. Outreach actvities

The LNGS staff is involved in many activities to make the local communities aware of the reasearches and progresses in cosmology and astroparticle physics, taking advantage of the beauty of the surrounding mountains of the Abruzzo Region as well as of the fascinating majesty of the civil engineering underground structures, coupled with the high-tech service plants and the experimental apparata. Our strategy is reported in the following points.

2.1. Visits

Last year the number of people visiting the underground facilities and main experiments hosted was around 8000. It is important to remark that, due to the constraints imposed by the construction of new detectors, visits are allowed just at week ends. Visitors consist mainly of high-school students which come for scientific tours organized by their teachers, who give them introductory lectures in advance.

They do not normally come from sorrounding regions cause, by tradition, programmes for cultural trips are made on a long-distance basis and last a few days. In order to face this matter the labs has been seeking a number of new initiatives to encourage visits at LNGS among local people.
Furthermore a modern Visitor Center devoted to astroparticle Physics is in progress. It will include exhibits, interactive devices and a sample of working particle detectors as a Fog chamber, PhotoTubes, nuclear emulsions and, of course, the Compact Cosmic Ray Telescope, that will be the milestone of the outreach and educational mission of the LNGS.

Figure 1. A group of students visiting the underground laboratory.

2.2. Open Day
Aseries of activities, in collaboration with school teachers and local scientific associations as the Association for Physics Teaching, addressed to students as well as to teachers, they are normally organized.
Although visits are mainly reserved for high school students, recently we have received an increasing number of requests from younger students wishing to visit our underground laboratory. To properly answer the requests of this particular range of people, we are planning special initiatives. As from 2002 we launched an initiative called Open Day. All the editions were a real success, with almost 2000 people attending.

Figure 2. On the left children are learning about the motion laws by playing "scientific toys". On the right a view of the Fermi conference hall during the award ceremony of the schools' competition "Anch'io Scienziato...".

The Open Day is a whole day during which the laboratory is open to the public with a number of events to entertain youngsters and less young; these include a visit to the underground laboratory, the possibility to ask researchers about the experiments in progress, a sort of "Carnival of Physics" in the

external infrastructures, both open-air and in the buildings, in which it is possible to learn physics and to participate in simple experiments.
In the stand "Outdoor Physics" students, mainly from schools in the surrounding area, perform experiments to explain daily life phenomena to the public.
To involve schools directly we usually organise the competition "Anch'io scienziato..." (I'm a scientist too...) dedicated to students (from kindergarden to high school) from all over the region. Students are supposed to conceive, plan and realize a scientific project in any field of science. In the last edition, more than 1179 students from 49 classes all over the region took part in the competition. The winning projects are awarded during the Open Day.

2.3. Gran Sasso – Princeton Summer School
The Gran Sasso-Princeton summer school, supported since 2004 by the Abruzzo Region, stems from the scientific collaboration between the Gran Sasso National Laboratory and the physics department at Princeton University.

Figure 3. On the left students are arranging thermodynamics experience during the laboratory session at Princeton. On the right the Italian students of the 2009 class awarded with the Diploma at the end of school.

The school takes place at Princeton University during the summer and lasts 3 weeks. The program is open to students coming from Abruzzo region and attending the fourth and fifth year of high school. For each edition a number of 20 students are selected on a competitive basis giving preference to fourth year students. The participants in the program are offered plane ticket to and back from Princeton and full accommodation and board in the Princeton campus. The activities in Princeton include physics courses and training in the field of physics and astrophysics, special relativity, fundamental calculus and English classes. Special seminars about the Gran Sasso activities and the main topics on modern physics are generally held. Students have weekends and some afternoons free to explore one of the most beautiful campuses in the United States, several facilities, observatories and museum. Furthemore, guided tours to New York, Philadelphia and Washington are scheduled at week ends. By visioning the results of the periodical survey the service uses to make on students of the previous editions, the feedback seems to be extremely positive. As a matter of fact a good percentage of students is now studying Physics or other scientific subjects at university.

3. Special tools for outreach: the compact cosmic ray telescope
By using the technology adopted for the realization of detectors in particle physics, in collaboration with the electronics service, a portable cosmic ray telescope to introduce non expert people in astroparticle physics through the direct visualization of the particle tracks has been realized.

The telescope consists of 10 planes made of Glass Resistive Plate Chambers equipped with electronics and readout. To display the particle path, the readout has been complemented by two LEDS matrices lightning when a particle crosses the device as shown in fig. 4.

Figure 4. The compact cosmic ray telescope developed at LNGS. A multi-track is visualized by using LED matrices in double view.

The telescope has been already used in outreach and public events with great success. In particular the detector has been running during the exhibition entitled “Eccellenze d’Italia” held in July in L’Aquila during the G8 meeting, the forum for governments of the eight richest countries in the world.

4. Museum of Physics and Astrophysics: the Galileium

The Galileium, the Museum of physics and astrophysics located in Teramo (40 km far the LNGS) and operational since May 2008, is the first example of a Science Center led by a research institution. It hosts permanent and temporary exhibitions with interactive paths, workshops and lessons. The mission for a science center is to connect the territory and its scientific “excellences” knowing how to exploit the different cultural resources, paying attention to the world of school, creating spaces of approach between the citizens and the scientific progress and technological innovation. The Galileium aim at "involving" the visitor, making science approachable to everyone and allowing everyone to interact regardless their level of education. The Galileium hosted public iniziatives in his first year of operations: the performance “Guarda che Luna”, the “Solar Day” and several seminars for the community.

5. Conclusion

Since the LNGS is a very attractive place, for its location in the heart of the mountain as well as for the "futuristic" experiments carried out, the main commitment of the Service in charge of Outreach and Communication is to constantly respond to the requests of visitors. The fashinating mistery of the origin and evolution of the Universe as well as the properties of neutrinos and astroparticles feed the curiosity of visitors and their thirst for knowledge making easier the outreach work at LNGS. Therefore, organizing scientific conferences, realizing prototypes, commissioning the construction of new exciting exhibits for the Museum or managing guided tours, is our way to involve people in the world of physics, making them aware of the importance of our scientific research and its applications to daily life.